Name:

Date:

**Multiple Choice (2pts each)**

1. Which events are disjoint?
   1. Rolling an odd number on a die and rolling a 5 on a die
   2. Rolling a 3 on a die and rolling an even number on a die
   3. Graduating from high school and being accepted into college
   4. Graduating from high school and playing an instrument
2. Which events are probably independent?
   1. Graduating from high school and being accepted into college
   2. Getting an odd number and a 5 on one roll of a die
   3. Drawing a red M&M candy from a package and then drawing a green M&M
   4. Winning a swim meet and winning the lottery
3. 57% of the senior class is female. Of the females, 14% are school athletes. What is the probability that a senior selected at random is a female school athlete?
   1. 81%
   2. 41%
   3. 69%
   4. not possible; gender and athletic status are disjoint events
4. Here is a partially finished tree diagram showing the political parties of local government officials and how they are expected to vote on a upcoming issue.   
     
   Which probability is represented by **x** on the diagram?
   1. The probability of no votes being cast
   2. The probability that a Democrat votes no
   3. The probability that a no vote was cast by a Democrat
   4. The probability that a vote is from a Democrat and is no.
5. Using the diagram in question 4, find these probabilities: (2pts each)
   1. *x*
   2. *y*
   3. P(No)
   4. P(No and Republican)
   5. P(No or Republican)
   6. P(No | Republican)
6. Label each pair of events as **disjoint**, **independent**, or **neither**, then **justify** you choice.
   1. A traffic light is red. At the same time, there is a car at this intersection with its headlights on. (1pt)  
        
      Justify: (3pts)
   2. A traffic light is green. At the same time, the traffic light for cross traffic is also green. (1pt)  
        
      Justify: (3pts)
   3. A traffic light is red. At the same time, there is a car stopped at the intersection. (1pt)  
        
        
      Justify: (3pts)
7. Brianna is using the two spinners shown below to play her new board game. She spins the arrow on each spinner once. Brianna uses the first spinner to determine how many spaces to move. She spins the arrow on each spinner once. Brianna uses the first spinner to determine how many spaces to move. She uses the second spinner to determine whether her move from the first spinner will be forward or backward.  
     
   1. Draw a fully labeled tree diagram to show the possible outcomes from spinning each spinner once. (3pts)
   2. What is the probability that Briana spins 3 spaces backward? (3pts)
   3. What is the probability that Briana moves forward? (3pts)
   4. Briana needs to move at least 2 spaces forward to get ahead of her opponent. What is the probability that this will happen on her next spin? (3pts)
8. In polls published by Rasmussen Reports in September 2010, 62% of likely U.S. voters believe that no matter how bad things are, Congress can always make them worse and 50% believe “a group randomly selected from the phone book could do as good a job as the current Congress.” Suppose 40% agree with both of these statements. What is the probability that likely U.S. voters agree with one statement or the other? (3pts)
9. An experiment tested a tree fertilizer on a large number of elm and oak trees to see whether it promoted positive changes such as growth, less brownage, or increased foliage. Below is a summary of the data collected in the experiment.  
     
   1. What would it mean for the effect of this fertilizer to be independent of the type of tree? (3pts)
   2. Do the data suggest effect (positive/negative) and tree type are independent? Explain. (3pts)
10. 85% of cars brought to Sam’s Garage need an oil change. Of those cars, 42% also need an additional repair or service. What is the probability that a car brought to Sam’s Garage needs both and oil change and an additional repair or service? **Show your work.** (3pts)
11. The Venn diagram at right shows the   
    percentages of cars at Sam’s Garage that   
    need an oil change or air in the tires.   
    **Show your work.**
    1. What is the probability that a car needs air in its tires?   
       (2pts)
    2. What is the probability that a car needs an oil change **or** air?   
       (2pts)
    3. What is the probability that a car needs an oil change **and** air?   
       (2pts)
    4. What is the probability that a car needs neither an oil   
       change nor air?  
       (2pts)
    5. Are needing an oil change and needing air mutually   
       exclusive events? (1pt)   
         
       Explain why or why not. (2pts)
12. The table shows the plans of a group of high school seniors. **Show your work**.   
      
    1. What is the probability that a senior plans to join   
       the military? (2pts)
    2. What is the probability that a senior plans to join   
       the military given the student is female? (2pts)
    3. What is the probability that a senior is female   
       given that the senior plans to join the military? (2pts)
    4. Explain what it would mean if the sex and post-graduate plans of seniors are independent. (2pts)
    5. Based on the table, does it appear that a senior’s   
       post-graduation plans are independent of the person’s sex? (2pts)   
       Justify your answer. (2pts)
13. In one version of a dice game called “Pig” players repeatedly roll a regular six-sided die, adding each number rolled to their score. Players may keep rolling as many times as they want to try to improve their score, but if they roll a 1, they lose all the points earned during that round.  
    1. What is the probability of rolling a 1 on your first roll?   
       (2pts)
    2. What is the probability of not rolling a 1 until the second roll?   
       (2pts)
    3. What is the probability of rolling your first 1 on your   
       1st or 2nd roll? (2pts)